

RECOGNITION OF *RHODOPHYLLIS CENTROCARPA* (MONTAGNE) COMB. NOV. (CYSTOCLONIACEAE, RHODOPHYTA) FROM CHILE

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ABSTRACT - An alga from Corral, southern Chile, represented by an ample collection of cystocarpic and tetrasporic specimens, is identified as *Rhodophyllis centrocarpa* (Montagne) comb. nov. [= *Sphaerococcus* (*Rhodymenia*) *laciniatus* var. *centrocarpus* Montagne 1839; type locality, Valparaíso]. *Rhodophyllis acanthocarpa* (Harvey) J. Agardh, a species occurring in the cold temperature waters of New Zealand and Macquarie Island, is merged with *B. centrocarpa* on the basis of similarity of vegetative and reproductive structure.

RÉSUMÉ - Une algue provenant de Corral (Chili méridional), représentée par une abondante collection de thalles à cystocarpes ou à tétraspores, est identifiée au *Rhodophyllis centrocarpa* (Montagne) comb. nov. [= *Sphaerococcus* (*Rhodymenia*) *laciniatus* var. *centrocarpus* Montagne 1839; localité type, Valparaíso]. *Rhodophyllis acanthocarpa* (Harvey) J. Agardh, espèce des eaux tempérées froides de Nouvelle Zélande et des îles Macquarie, est à rapporter au *R. centrocarpa* sur la base de similitudes de la structure végétative et reproductive. (traduit par la rédaction).

KEY WORDS : Chile, Cystocloniaceae, marine algae, *Rhodophyllis acanthocarpa*, *R. centrocarpa*, Rhodophyta, *Rhodymenia centrocarpa*.

INTRODUCTION

In the holdings of the University of Michigan Herbarium are some marine algae collected by Prof. Roland Thaxter, the renowned mycologist of Harvard University. These collections of algae were made, along with numerous collections of fungi, insects, and higher plants, by Thaxter at several locations in Chile, Fuegia, and the Falkland Islands, where he spent several months during the austral summer of 1905-06 (Weston, 1933). Previously, my noticing some Thaxter collections (in FH and NY) from Punta Arenas, southern Chile, misidentified as *Schizoneura hookeri* (Lyll) J. Agardh, a synonym of *Laingia hookeri* (Lyll) Kylin, resulted in a paper on their true identity, namely, *Pseudolaingia larsenii* (Skottsberg) Levring (Wynne, 1989). According to Dodge (1933), sometime after 1920 Thaxter turned over a large collection of marine algae to W.R. Taylor, which explains how they came to reside in MICH.

An assortment of 10 cards of foliose red alga labelled from "Corral, Chili" with the identification, in Thaxter's hand, of "*Rhodophyllis centrocarpa* (Mont.)" piqued my curiosity. Realizing that this binomial was apparently never published and also realizing that the genus *Rhodophyllis* is not listed in contemporary floristic lists of

Chilean marine algae, I attempted to determine the identity of this material, which consisted of many cystocarpic and tetrasporic specimens. I also recognized that the status of *Rhodymenia centrocarpa* (Montagne) needed re-investigation.

MATERIALS AND METHODS

This investigation was largely the result of an examination of the Thaxter collections in MICH. Herbarium abbreviations are based on Holmgren *et al.* (1990). Portions of the herbarium specimens were rehydrated and mounted on slides for microscopic study. In some cases the material was stained with a mixture of very dilute (less than 1%) aniline blue acidified with acetic acid and also containing 30% liquid glucose (Karo syrup). A standard Zeiss research microscope equipped with *camera lucida* was used to make the line-drawings.

OBSERVATIONS

The morphological range of the Thaxter-collected "*Rhodophyllis centrocarpa*" is depicted in Figure 1-8. Thalli may be essentially simple (Fig. 2), deeply lobed (Figs 1 & 7), pinnately divided (Fig. 4), or more or less palmately divided (Figs 3 & 5). The color of these pressed specimens remains a rosy-crimson despite their having been collected almost 90 years ago. The 10 specimens consists of 7 cystocarpic thalli (Fig. 1-3, 6-8) and 3 tetrasporic thalli (Figs 4 & 5). The blade margins in all of the specimens are fimbriate, their fimbriae being more obvious in the cystocarpic blades. Specimens range in height from 4.5-6.0cm to a maximum of 8.0cm. The width of the primary blades ranges from 1.8 to 3.0cm. The primary blade is typically broader than the secondary blades. In Fig. 5, however, the primary blade is reduced in size, and the secondary blades are more strongly developed. Apices are generally rounded or obtuse. Thalli are attached by a relatively small discoid holdfast, accompanied by a few secondary attachments in the proximal parts of the thallus.

Growth is uniaxial, in that young laterals are terminated by a single apical cell. When blades were stained with aniline blue, the axial cells coursing through the ill-defined medulla were evident. The cortical cells show a rosette arrangement in which larger less-pigmented cells, forming a subcortical layer, are surrounded by smaller more-pigmented cells, lying at the surface of the thallus (Fig. 10). Such a cortical organization occurs in three genera of the Cystocloniaceae, including *Rhodophyllis* (Hansen, 1980).

In all of the female thalli the cystocarps, which are spiny and irregular in outline (Figs 12 & 13), are located on the marginal fimbriae. On a single female thallus (Fig. 8) the cystocarpic proliferations are also produced over the blade surface as well as on the margin. The material was too fragile to permit detailed study of the developmental stages of the cystocarp. Tetrasporic thalli (Figs 4 & 5) produce sori of tetrasporangia in broad areas over the blade surface. The tetrasporangia are zonately divided and scattered among the cortical cells (Fig 11).

The unpublished binomial on the label, "*Rhodophyllis centrocarpa*", caused me to examine the basis of this name, *Rhodymenia centrocarpa* (Montagne, 1839, 1847, 1852, 1854). Montagne's (1854) depiction of this alga is reproduced in Figure 9. A striking resemblance to Thaxter's collections from Corral is immediately obvious. The location of the cystocarps on marginal fimbriate processes and the presence of spiny projections on the cystocarps are important shared characteristics. I conclude that Thaxter was correct in regarding his Chilean material as conspecific with *Rhodymenia*

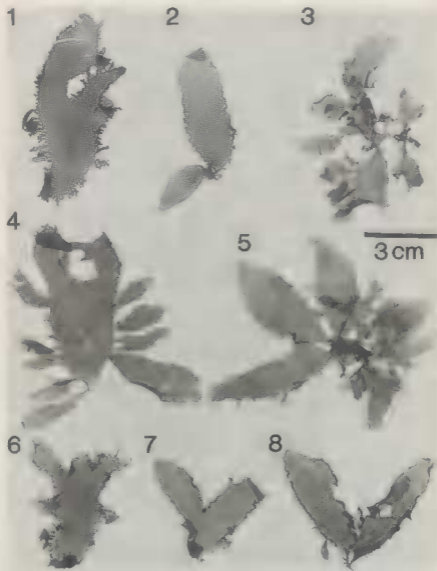
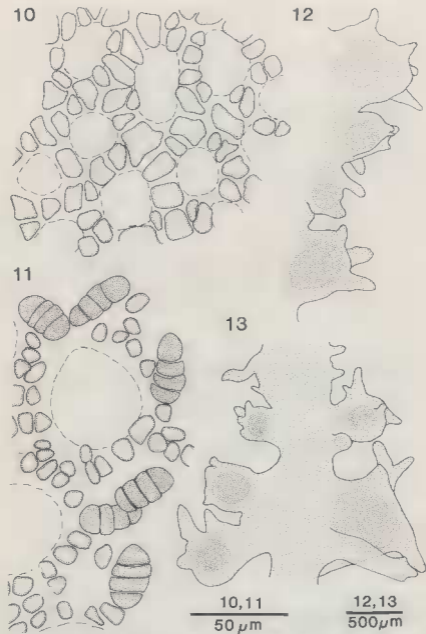


Fig. 1-8: *Rhodophyllis centrocarpa*. (bar equal to 3cm). Thaxter collections from Corral, Chile. Figs 1-3, 6-8: Cystocarpic thalli. Cystocarps in 8 arising both from blade margins and blade surface. Figs 4 & 5: Tetrasporic thalli.

centrocarpa and that this taxon conforms to *Rhodophyllis* (Min-Thein & Womersley, 1976). The question of which species of *Rhodophyllis* is treated below.



Fig. 9: Reproduction of Montagne's (1854) pl. 15, fig. 1, of *Rhodymenia* (*Calliphyllis*) *centrocarpa*.



Figs 10-13: *Rhodophyllis centrocarpa*. Fig. 10: Surface view of cortex showing rosette arrangement of larger underlying cells surrounded by an overlying layer of smaller cells. Fig. 11: Surface view of thallus with tetrasperangia. Figs 12 & 13: Marginal location of cystocarps.

DISCUSSION

Floristic accounts of benthic marine algae of Chile in the last half-century (Taylor, 1947; Levring, 1960; Etchevery, 1986; Santelices, 1989; Ramirez & Santelices, 1991) have made no mention of *Rhodymenia centrocarpa*, nor have they included the genus *Rhodophyllis*. Howe (1914) seems to be the last author to have made reference to *Rhodymenia centrocarpa*, when he indicated that the original collection "is apparently not to be found" in PC. Howe thought that Montagne's species was "probably a *Callophyllis*" mainly because Montagne used the parenthetical subgeneric or sectional name "*Calliphyllis*" and compared his species with the alga now known as *Callophyllis laciniata* (Hudson) Kützting. Montagne (1852) stated that contrary to his earlier view this alga ought not to be regarded as merely a variety of *R.* [now *Callophyllis*] *laciniata*, since it differs by the form and branching of the frond and by the marginal dentations where the cystocarps are developed. Howe (1914) also pointed out that Montagne's (1839) first record of this plant (as *Sphaerococcus laciniatus* var. *centrocarpa*) was altered from Callao, Peru, to Valparaiso, Chile (Montagne, 1852, 1854, 1856), which is about 7 degrees north of Corral.

Of the approximately 16 species of *Rhodophyllis*, the Chilean plant bears the closest resemblance to *R. acanthocarpa* (Harvey) J. Agardh (Harvey, 1855; J. Agardh, 1876; Ricker, 1987). Like *R. acanthocarpa*, but unlike all other species in the genus except *R. laingii** (Chapman, 1979), the Chilean plant has spiny cystocarps. In his account of *R. acanthocarpa* from Macquarie Island, Ricker (1987) stated that the cystocarps, which were spiny, were usually marginal but were occasionally on the blade surfaces, as was observed on one Chilean specimen. Ricker (1987) also referred to plants of *R. acanthocarpa* as having ■ discoid holdfast or branched basal axes with multiple attachment pads. My conclusion is that this Chilean alga is identical to *R. acanthocarpa*, a species that is well known from southern New Zealand (Cotton, 1908; Adams *et al.*, 1974; Chapman, 1979; Nelson *et al.*, 1992), the Chatham Islands (Nelson *et al.*, 1991) and the Subantarctic islands of New Zealand (Hay *et al.*, 1985), and Macquarie Island (Ricker, 1987).

The evidence points to the following conclusions:

- 1) the Thaxter collections from Corral, Chile, can be identified as *Rhodymenia* (*Calliphyllis*) *centrocarpa* (Mont.) Mont.;
- 2) this species has nothing to do with *Rhodymenia* or with *Callophyllis* but belongs to *Rhodophyllis* of the Cystocloniaceae; and,
- 3) *Rhodymenia centrocarpa* (Mont.) is conspecific with *R. acanthocarpa* (Harvey) J. Agardh, the former name having nomenclatural priority:

* In his description of *Rhodophyllis laingii*, which was based on a single specimen, Cotton (1908) stated that it was similar to *R. acanthocarpa* but differed in having larger and thicker thalli as well as having a more clearly marked "rosulate-areolate arrangement" of the cortex. Laing (1939) doubted the distinctiveness of *R. laingii*, and Ricker (1987) regarded *R. laingii* as conspecific with *R. acanthocarpa*. Chapman (1979) maintained *R. laingii* as distinct, separating it from *R. acanthocarpa* by its pinnate branching and its greater height (15cm vs. 10cm). Nelson and Adams (1987) referred to Lindauer's Alg. N.Z. Exsicc. No. 319 "*Rhodophyllis laingii*" (from the Bay of Islands are) as of "uncertain" identity.

Rhodophyllis centrocarpa (Montagne) comb. nov.

Basionym: *Sphaerococcus* (*Rhodymenia*) *laciniatus* var. *centrocarpus* Montagne, 1839, p. 28.

= *Rhodymenia* (*Calliphyllis*) *centrocarpa* (Montagne) Montagne, 1852, p. 316; 1854, p. 302, pl. 15, fig. 1.

= *Palmaria centrocarpa* (Montagne) Kuntze, 1891, p. 909.

It appears that the present report is the first certain record of *Rhodophyllis* from the Pacific coast of south America. *Leptocladia peruana* Howe was transferred to *Rhodophyllis* by Abbott (1968), albeit tentatively because she had not seen cystocarpic material. After examining female plants, Acleto (1973) returned the species to *Leptocladia*.

Rhodophyllis acanthocarpa [now *R. centrocarpa*] has been characterized by Ricker (1987) as a sub-antarctic species. Earlier Santelices (1980) called attention to the significant component (about 34.4%) of the temperate Pacific South American benthic flora that shows definite sub-antarctic affinities. *Rhodophyllis centrocarpa* can be added to that list of species.

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